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Substituting Wheat Flour with Banana Skin Flour from Mixture Various Skin Types of Banana on Making Donuts

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***Abstract*— Tropical forest plants is a very rich source of chemical compounds or bioactive efficacious . Many of the compounds potential as a source of raw materials in food processing . One is the banana plant , West Sumatra Padang and Bukittinggi is one area in Indonesia with banana . Generally people in West Sumatra just consume or eat the fruit and throw banana skin just because it is considered as waste (waste banana peel) . When the banana peel waste is left alone so do not rule out the possibility for the accumulation of garbage or waste banana peels , especially in the West Sumatra city of Padang and sekitarnya.Salah one solution that can be done is to harness and cultivate the banana peel waste into a material more useful for example in the manufacture of foodstuffs.Banana peel flour with all the treatments can produce flour banana peel . However, the manufacture of flour banana skin with the use of sodium metabisulfite 1% at 1 hour of soaking to get the best flour . Having obtained done banana peel flour donut - making flour substitute banana peel . The use of banana peel flour with different concentrations turned out to affect the organoleptic properties of the donut . Of hedonic organoleptic test , the results of the average value of the ratio between wheat flour with flour banana skin that gives the best results for color , aroma , and flavor that is a donut with banana peel flour ratio of 0 % to 100 % wheat flour and donuts with banana peel flour ratio 10 % with 90 % wheat flour , but the texture will be best results are donuts of banana peels can be made by substituting wheat flour with flour banana skin at 10 %. Carbohydrate content of flour banana skin with the use of sodium metabisulfite 1% at 1 hour soaking of 16.60 grams.**

***Keywords*— Banana Skin; Sodium metabisulphite; Appearance; Donuts**

I. INTRODUCTION

According Susanti 2006 [7], plants of tropical forests is a very rich source of chemical compounds or bioactive efficacious. Many of these compounds as a potential source of raw material in food processing. One of them is the banana plant, West Sumatra Padang and Bukittinggi is one of the regions in Indonesia with a banana. Most people in West Sumatra just consume or eat the fruit and throw the banana skin just because it is considered as waste (waste banana peels). When the banana peel waste is left alone then it is possible for the accumulation of garbage or waste banana skin, especially in the West Sumatra city of Padang and surrounding areas. Given this reality, it must find a solution to handle the waste banana peel. One of the solutions that can be done is to utilize and process the banana peel waste into a more useful materials, for example in the manufacture of foodstuffs. For that we study this substitution was taking the title with Flour Banana Skin of Various Mixed Waste Banana Skin On Making Donuts. Donat is one of the most popular snack food in West Sumatra. Padang City. The banana peel flour has amounted to 18.50% carbohydrate content causes potential banana skin as a source of starch for the manufacture of donuts. In making donuts using flour made from wheat, therefore we substitute wheat flour with flour banana skin to reduce the use of wheat flour are still imported from abroad and besides that it also can reduce the cost of production in the making donuts. Banana peel flour can be made with very low cost and can be done by anyone with the means of drying in the sun and grind the flour mill in the traditional market. Banana peel flour obtained can then be used as substitution flour in the donut-making so as to reduce the use of expensive flour and reduce production costs in the donut-making so that the profits can be greater in small and medium industries (SMEs).

II. METHODOLOGY

A. Time and Place

This research was conducted at the Laboratory of Food in Campus of *Akademi Teknologi Industri Padang* (ATIP) - Padang Tabing in May 2013.

B. Tools and Materials

The tools used are buckets, knives, blender, basin, pan / tray, labels, stationery, and scales. Organoleptic tests used for assessment forms and stationery.

For processing into flour banana skin is the materials used are waste of artisan fried banana skin around Tabing, sodium metabisulphite and water. The materials used for the manufacture of flour donuts banana peel, flour, sugar, yeast, eggs, butter, salt and water. Materials used for organoleptic test was banana peels donuts and drinking water test results.

C. Preliminary Experiment

Prior to the making of the donut-making flour made from banana skin first. Preliminary experiments for the manufacture of flour banana skin that is looking for a suitable concentration for use of sodium metabisulphite and the influence from duration of immerssion. The concentration of sodium metabisulfite is used for the manufacture of flour is 1%, 2% and 3% with a soaking time 1 hour, 6 hours, 12 hours and 24 hours.

TABLE I
VARIATIONS IN PRELIMINARY EXPERIMENT

Concentration of Na2S2O5(%)	Duration of Immersion (hour)
1	1
	6
	12
	24
2	1
	6
	12
	24
3	1
	6
	12
	24

Having obtained the best flour banana peels performed the experiment of making donuts from a banana peel flour with flour substitution treatment banana skin as much as 40%, or a ratio of 40: 60 implementation of a preliminary experiment is intended to determine whether bananas can be change skin flour flour with a concentration of 40%. The basis for the selection of this treatment that substitution a material to processed food of flour is 40% maximum

D. Procedure of Preliminary Experiment

The procedure in preliminary experiments that 60% wheat flour and 40% banana peel flour, refined sugar and yeast in the insert into the basin, while in the mix well, then add water and egg yolks into the mixture, until half smooth, then add butter and salt , knead dough until smooth and continue with the first fermentation process for 30 minutes covered with a damp cloth. After fermentation take approximately 30 grams and rounded off manually. Fermentation II for 15 minutes. Cooking oil is heated with lots of volume, on low heat and fermented dough, molded like a ring then fried until done (golden brown). Then lifted then drained and cooled.

E. Procedure of Making Banana Skin Flour

From preliminary experiments have been carried out in get ways of making banana flour skin with concentration and immersion time proper sorting of waste banana peel is obtained, then use the banana skin that is still good in the texture is not too soft and there are not many black spots. Having collected a decent banana skin to be processed then the banana peel cut into small pieces this is done to make the product more uniform and simplify subsequent processing. Banana peel which has been cut into pieces washed with running water. The next stage was soaking for 1 hour in water that has been diluted $Na_2S_2O_5$ 1%. After the material is drained and washed with water and steamed for 15 minutes. The next stage is drying in the oven <± 60 ° C for 4 hours after it in a blender until smooth and flour sifted with a sieve.

F. Procedure of Making Donuts with Banana Skin Flour

From preliminary experiments have been conducted on making donuts of flour and wheat flour banana skin that is a ratio of 40%: 60% in this experiment obtained lower the concentration of the use of banana peel flour with the procedures flour, banana peels, refined sugar, and yeast included into the bowl then stir until evenly distributed. Water and added to the egg yolk mixture was then diuleni until half smooth. Add butter, which has been steamed pumpkin, and salt until dough then diuleni really dull. Once the dough is smooth fermentation process is carried out first for 30 minutes with closed using a damp cloth.

After fermentation, the dough is divided roughly 30 grams and rounded off manually. Then the second fermentation process is carried out for 15 minutes. Besides the dough is fermented, heated oil with lots of volume with a small flame. That has been fermented dough is then molded ring then fried until cooked (yellow-brown), and then removed, drained, and cooled.

G. Treatment

In this study, conducted three comparative material to suppress the use of flour while making innovative products. The treatment is carried out in this study include:

- The first treatment: 90% flour, 10% flour banana skin
- Second treatment: 80% flour, 20% flour banana skin
- The third treatment: 70% flour, 30% flour banana skin

H. Observations

Observations were made on the organoleptic properties of banana peel flour donuts. Organoleptic properties collected by organoleptic test on a banana peel flour donut products with 4 treatments.

In this study organoleptic test was conducted to determine the organoleptic properties (A) donut flour banana skin, namely the color, aroma, texture, flavor, and also to determine the level of

A hedonic test or rate and acceptance of the products made by 30 untrained panelists by providing testing sheet (questionnaire) were each filled individually by the panelists. Charging organoleptic sheet aims to determine the level of liking for the product. The panelists presented a banana peel flour donut products with various treatments as mentioned above and then given an explanation of the panelists regarding the intent and purpose of charging and points per

point of her. With the product and presented it Minun water and sheets are free to fill panelists testing the test pieces in accordance with their preferences in the product. The hedonic testing using a 3 (three) scale with values like (3), less likely (2), do not like (1).

Data obtained from sheet form then tabulated and organoleptic tests performed counting the number of panelists who like, not like, and not like the organoleptic properties of the product. A level value of the panelists then averaged based on the degree of liking for texture, aroma, flavor, and color.

III. Result and Discussion

A. Preliminary Experiments

In preliminary experiments the manufacture of banana skin flour was obtained the following results :

TABLE III
DESCRIPTIVE MARKING ON BANANA SKIN FLOUR

$Na_2S_2O_5$ (%)	Duration of Immerssion (hour)	Colour	Scented	Texture
1	1	Yellow	banana	smooth
	6	Yellow	banana	smooth
	12	Yellow	banana	smooth
	24	Yellow	banana	smooth
2	**1**	Yellow	banana	smooth
	6	Yellow	banana	smooth
	12	Yellow	A litle bit banana scented	A bit rough
	24	Yellow	A litle bit banana scented	smooth
3	1	Yellow	A litle bit banana scented	smooth
	6	Yellow	A litle bit banana scented	A bit rough
	12	Yellow	A litle bit banana scented	smooth
	24	Yellow	A litle bit banana scented	A bit rough

Results of Preliminary Experiment
Preliminary Trial Results Wheat Banana Skin

From preliminary experiments all treatments can indeed produce flour banana skin, with a description of the organoleptic test result is that the use of sodium metabisulphite 1%, 2%, 3% flour produced will have the same colour but to a concentration of 2% sodium metabisulphite and 3 % banana peel smell it though lost and smell of banana peel flour produced no odour of sodium metabisulphite. For the parameters of immersion time in this preliminary experiment with soaking time is 1 hour, 6 hours, 12 hours, and 24 hours of getting soaked with sodium metabisulphite old also affect the odour of banana peel flour produced. For colour does not affect this depends on how the sort of banana skin obtained because there is no difference in colour after the addition of sodium metabisulphite during immersion.

Here the test description for the category only colour, texture and flavour, because the preliminary test is intended to determine an appropriate use in the manufacture of flour banana skin.

From these preliminary experiments resulting flour banana skin has uniform colour but different odours and concentrations obtained as well as fitting the soaking time at a concentration of 1% with a 1 hour soaking time.

TABLE IIIII
THE RESULTS OF CARBOHYDRATE ANALYSIS FLOUR BANANA SKIN SODIUM METABISULPHITE 1%, DURATION IMMERSION 1 HOUR

No	Nutritions	Level
1	Carbohydrat e(g)	16,60

Analyses of carbohydrates of banana peel flour 1% sodium metabisulphite, Long Immersion 1 hour at 16.60 grams nearing Susanti research in 2006 is 18.50 g. So flour banana skin in use on

This research can be seen to contain macro nutrients: proteins, fats, and carbohydrates and very little or even not contain the vitamins and minerals needed by the body. So with the addition of a banana peel flour can improve nutritional content on donuts particular vitamins and minerals needed by the body in which the banana peel is rich in minerals and vitamins, especially the calcium-containing nutrients is quite high at 715 mg / 100 g.

B. Preliminary Trial Results Donuts Banana Skin

Having obtained the appropriate flour banana peels performed preliminary experiments on the making of donuts. In preliminary experiments donut-making is the banana skin with a banana peel flour substitution by 40%. In this preliminary experiment that produced hard donuts and fried texture when broken.

According to Sufi (2009) [8], the main ingredient in the manufacture of flour donuts. This is because wheat flour has a protein content key role in making a donut that is gluten. Protein content affects the amount of gluten that of the flour. Gluten affects the firmness and elasticity of the flour. The higher the elasticity and suppleness of the desired product then mixing flour banana peels would be lower. So the authors tried to improve the texture of skin banana donuts with continuing subsequent experiments by performing the procedure modification. From the initial experiments, the use of flour donuts with banana skin texture generated 40% is not good then the author tries to vary the procedures by lowering the percentage of banana peel flour on making these donuts.

C. Donuts Banana Skin

From the results of preliminary experiments and then proceed to experiment with lowering levels of banana peel flour because in preliminary experiments with the use of banana peel flour content of 40% is not good so I lose by varying levels.

TABLE IVV
COMPARISON OF THE USE OF SKIN BANANA FLOUR AND WHEAT FLOUR IN MAKING DONUTS

No	Banana Skin Flour(%)	Wheat Flour (%)
1	30	70
2	20	80
3	10	90

The products of the treatment results and conducted tests on the nature organoleptic.

D. Organoleptic test

In this study, the authors conducted a hedonic organoleptic test or test panel A to the product. Hedonic test was conducted on May 17, 2013 in the building room 202 Chemical Analysis of Industrial Technology Academy Champaign campus at 15:30 pm. The rooms are equipped with air-conditioning is used and the conditions were calm.

The results of the hedonic test on a banana peel donut products are outlined in the tables below and the calculation of test data summary is attached.

E. Descriptive assessment Donuts

Descriptive assessment of the donuts include colour, flavour, aroma, and texture done by researchers and two panellists. In table 4.dapat seen donuts descriptive assessment results

TABLE V
RATING DESCRIPTION DONUTS

Comparison (%)	Code	Colour	Taste	Aroma	Texture
10 : 90	AA	Yellow brown	sweet	donat	Smooth
20 : 80	BB	Brown	Sweet, a bit chelates	A bit banana scented	A bit rough
30 : 70	CC	Brown	Sweet, a bit chelates	A bit banana scented	A bit rough
0 : 100	DD	Yellow Brown	sweet	donat	Smooth

Average for the overall description of the colour category panellists mentioned that the colour of this donut is yellowish brown. For product AA yellow colour looks brighter, yellow BB donuts still visible but not as bright as that is beginning to look a donut AA brown colour, for donuts CC yellow and brown colour fade more clearly while on Donuts DD brighter yellow colour than donuts AA , BB and CC it is in because the treatment of DD donuts no additional flour banana skin (0%).

In the category of aroma properties showed an average of overall comments panellists that the CC and DD's donuts still smell of banana. But there are also comments that mention the donut AA banana peel aroma is weak, whereas for BB and CC donuts banana scent stronger.

In the category of taste nearly half of the panellists mentioned donuts BB and CC feels a bit chelates. While the rest of the donut AA mentions delicious taste typical flavours of banana skin does not feel anymore.

For texture categories, comments of the panellists are AA and DD donut texture is soft and thirsty but DD donuts finer than AA. As for the BB and CC donut texture is rough and hard.

F. Value Organoleptic Test Results

TABLE VI
AVERAGE VALUE PROPERTIES APPEARANCE (COLOR, AROMA, TASTE, AND TEXTURE) LEATHER BANANA DONUTS WITH FOUR (4) TREATMENT

Aspect	Treatment on Banana Skin Donuts							
	AA (10 %)		BB (20 %)		CC (30 %)		DD (0 %)	
	π	k	π	k	π	k	π	k
Colour	2.67	S	2.26	KS	2.26	KS	2.9	S
Aroma	2.7	S	2.13	KS	2.4	KS	2.86	S
Taste	2.83	S	2.06	KS	2.33	KS	2.93	S
Texture	2.9	S	2.16	KS	2.06	KS	2.9	S

Note: π = average, k = category, S = love (value 3), KS = less like (value 2), TS = do not like (value 1)

From the table above the average can be seen that the addition of flour donuts with banana skin treatment as much as 10% already have the likes assessment of the panelists. However, the treatment of BB and CC donuts panelists reduced level of preference.

Seen on the donut on the color category for BB and CC treatment is by the addition of flour banana skin treatment as much as 20% and 30% obtained results are less likely while the treatment of AA and DD with the addition of flour banana skin treatment as much as 10% and 0% the result is love of panelists. In the category of scents with AA and DD treatment showed an average like. For the category of sense in the treatment of AA and DD donuts get average results like. In the texture category AA and DD treatments get results like this in the hedonic test while in the BB and CC treatment are less likely to get results.

For a description of each category organoleptic properties (color, aroma, flavor and texture) has been in detailed as below:

TABLE VII
NUMBER (%) BY CATEGORY PASSIONS PANELIST ON THE NATURE COLORS DONUTS FOR EACH TREATMENT

Category	Treatment on Banana Skin Donuts			
	AA (10 %)	BB (20 %)	CC (30 %)	DD (0 %)
3 (love)	76.67 %	33,33 %	40 %	93 %
2 (less likely)	23,33 %	60 %	53,33 %	6,67 %
1 (do not like)	-	6,67 %	6,67 %	-

From Table 7 the results of test A / organoleptic overall the color of candied dried banana skins is as follows:

(1) On a scale like donuts AA obtained 76.67% of panelists, 93% of panelists DD donuts, donuts CC BB 40% whereas 33.33% was obtained panelists, it is because they more and more concentration of flour used banana peels cause donut color in produce more chocolate. The results of organoleptic test against this color increase panelists vary because of different preferences.

(2) For AA donuts known to 76.67% and DD 93% of panelists liked the color of this donut is a donut with AA treatment using a banana peel flour using as much as 10% and as much as 0% DD donuts while for donuts with BB and CC that treatment with use flour banana skins each as much as 20% and 30% earn 60% and 53.33% of the panelists expressed less like the donuts.

TABLE VIII
NUMBER (%) BY CATEGORY PASSIONS PANELIST ON THE NATURE AROMA DONUTS FOR EACH TREATMENT

Category	Treatment on Banana Skin Donuts			
	AA (10 %)	BB (20 %)	CC (30 %)	DD (0 %)
3 (love)	83,33 %	30 %	46,67 %	86,67 %
2 (less likely)	16,67 %	53,33 %	46,67 %	13,33 %
1 (do not like)	-	16,67 %	6,67 %	-

From Table 8 the results of test A / organoleptic overall aroma of donuts on a banana peel is as follows:

1. On a scale of AA and DD likes donuts each get 83.33% 86.67% panelists and donuts while BB and CC only got 30% and 46.67% of panelists.

2. As with the test of liking for the color category, the category A panelist aroma was very diverse. The less use of banana peel flour increased level of preference.

TABLE IX
NUMBER (%) BY CATEGORY PANELISTS PASSIONS AGAINST NATURE DONUTS SENSE FOR EACH TREATMENT

Category	Treatment on Banana Skin Donuts			
	AA (10 %)	BB (20 %)	CC (30 %)	DD (0 %)
3 (love)	86,67 %	23,33 %	43,33 %	93,33 %
2 (less likely)	10 %	60 %	46,67 %	6,67 %
1 (do not like)	3,33 %	16,67 %	10 %	-

From Table 9 the results of test A / organoleptic overall aroma of donuts on a banana peel is as follows:

1. On a scale of 1 to donuts like AA and DD got value respectively 86.67% and 93.33% of panelists, donuts BB panelists got 23.33% and 43.33% CC donuts panelists.

2. Assessment in this sense is very diverse category, but it can be said the reduction in the use of banana peel flour taste preference level to the higher this is because sense chelates banana skin match donuts are also reduced. However, no increase in the level of preference this is because each panelist has diverse preferences.

TABLE X
NUMBER (%) BY CATEGORY PASSIONS PANELIST ON THE NATURE TEXTURE DONUTS FOR EACH TREATMENT

Category	Treatment on Banana Skin Donuts			
	AA (10 %)	BB (20 %)	CC (30 %)	DD (0 %)
3 (love)	86,67 %	20 %	13,33 %	90 %
2 (less likely)	13,33 %	76,67 %	73,33 %	10 %
1 (do not like)	-	3,33 %	6,67 %	-

From table 10 An organoleptic test results to the overall texture of the skin banana donuts are as follows:

1. On a scale of A love for the texture of the donut category AA gets 86.67% of panelists, donuts DD gets 90% of panelists, donuts BB gets 20% of panelists and panelists donuts CC 13.33%.

2. For the donuts with flour substitution treatment CC banana peel 30% in this category received the lowest score, and the reduction in the use of banana peel flour A increases. This is because the use of flour donuts with banana skin with a low concentration will be more tender texture like regular donuts without the addition of flour banana skin, it also caused the manufacture of flour banana skin less smooth so that the texture of the skin banana donuts are also less smooth.

IV. CONCLUSIONS AND RECOMMENDATIONS

A. Conclusion

From the results and discussion at the end of this paper can be summarized as follows:

Flour banana skin with all the treatments can produce flour banana skin. However, the manufacture of flour banana skin with the use of 1% sodium metabisulfite in 1 hour of soaking to get the best flour. Having obtained a banana peel flour be making donuts substituting flour banana skin. The use of banana peel flour with different concentrations apparently affect the organoleptic properties of the donut. Of hedonic organoleptic test, the results of the average value of the ratio between wheat flour with flour banana skin that gives the best results for color, aroma, and taste of the donuts with banana peel flour ratio 0% to 100% wheat flour and donuts with banana peel flour ratio 10% with 90% wheat flour but the texture obtained the best results on a banana peel flour ratio of 10% with 90% wheat flour it is proved that the donuts from banana peels can be made by substituting wheat flour with flour banana skin at 10 %. Carbohydrate content of banana peel flour with the use of 1% sodium metabisulfite in 1 hour immersion at 16.60 grams and compared with Susanti research in 2006 amounted to 18, 50 grams. Susanti Dilibandingkan of research in 2006 was the result of carbohydrate obtained approached Susanti research in 2006.

B. Suggestion

Based on the research results and observations during the research process, the authors would like to advise that for further research in order to Touch ups adding color by using carrots and also can replace flour with flour mokaf terigunya and extend the range to scale A hedonic test.

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